

Supply Chain Management

The management of the flow of goods and services is known as supply-chain management. It includes the storage and movement of goods from the point of origin to the point of consumption. This chapter discusses in detail the concepts and processes related to supply chain management as well as the various components of supply chain.

Supply chain management (SCM) is the broad range of activities required to plan, control and execute a product's flow, from acquiring raw materials and production through distribution to the final customer, in the most streamlined and cost-effective way possible.

SCM encompasses the integrated planning and execution of processes required to optimize the flow of materials, information and financial capital in the areas that broadly include demand planning, sourcing, production, inventory management and storage, transportation - or logistics - and return for excess or defective products. Both business strategy and specialized software are used in these endeavors to create a competitive advantage.

Supply chain management is an expansive, complex undertaking that relies on each partner - from suppliers to manufacturers and beyond - to run well. Because of this, effective supply chain management also requires change management, collaboration and risk management to create alignment and communication between all the entities.

In addition, supply chain sustainability - which covers environmental, social and legal issues, in addition to sustainable procurement - and the closely related concept of corporate social responsibility - which evaluates a company's effect on the environment and social well-being - are areas of major concern for today's companies.

Benefits of Supply Chain Management

Supply chain management produces benefits such as new efficiencies, higher profits, lower costs and increased collaboration. SCM enables companies to better manage demand, carry the right amount of inventory, deal with disruptions, keep costs to a minimum and meet customer demand in the most effective way possible. These SCM benefits are achieved through the appropriate strategies and software to help manage the growing complexity of today's supply chains.

Supply Chain Strategies are the critical backbone to Business Organizations today. Effective Market coverage, Availability of Products at locations that hold the key to revenue recognition depends upon the effectiveness of Supply Chain Strategy rolled out. Very simply stated, when a product is introduced in the market and advertised, the entire market in the country and all the sales counters need to have the product where the customer can buy and take delivery. Any glitch in the product not being available at the right time can result in the drop in customer interest and demand which can be disastrous. Transportation network design and management assume importance to support sales and marketing strategy.

Inventory control and inventory visibility are two very critical elements in any operations for these are the cost drivers and directly impact the bottom lines on the balance sheet. Inventory means value and is an asset to the company. Every business has a standard for inventory turnaround that is optimum for the business. Inventory turnaround refers to the number of times the inventory is sold and replaced over a period of twelve months. The health of the inventory turn relates to the health of business.

In a global scenario, the finished goods inventory is held at many locations and distribution centers, managed by third parties. A lot of inventory would also be in the pipeline in transportation, besides the inventory with distributors and retail stocking points. Since any loss of inventory anywhere in the supply chain would result in loss of value, effective control of inventory and visibility of inventory gains importance as a key factor of Supply Chain Management function.

Components of SCM

It is very important for businesses to ensure two things for their supply chain to be effective, one is the supply chain should be cost effective and second it should deliver the results on time. We began with the description of supply chain management of bread. It is a very simple one. There are many complicated supply chain management processes that differ with the size of the business as well as the complexity of the chain and the number of products involved at each step. Thus, supply chain management begins at the origin of the product or service, and ends at the delivery and consumption of the same by the end user.

There are a million things which we use or consume in our everyday lives, and supply chain management weaves through it all, creating a harmonious and efficient environment. Any break in this chain can actually result in disruption of the system with a domino like effect. Supply chain management is made up of a few components that are very important as well as critical to the system. We shall discuss each of the components in brief.

Planning

This is one of the most important stages. Before the beginning of the entire supply chain, it is essential to finalise the strategies and put them into place. Checking the demand for the product or service, checking the viability, costing, profit, and manpower etc. are vital. Without a proper plan or strategy in place, it will be well-nigh impossible for the business to achieve effective and long term benefits. Therefore, enough time has to be devoted to this phase. Only after the finalisation of the plans and consideration of all pros and cons, can one proceed further. Every business needs a plan or blueprint or a roadmap based on which the strategies are made. Planning helps to identify the demand and supply trends in the market and this, in turn, helps to create a successful supply chain management system.

Information

The world today is dominated by a continuous flow of information. In order to be successful, it is essential that a business stays abreast with all the latest information about the various aspects of its production. The market trends of supply and demand for a particular product can be best understood if the information is properly and timely disseminated through the many levels of the business. Information is crucial in a knowledge-based world economy, and ignorance about any aspect of business may actually spell doom for the prospects of the business.

Source

Suppliers play a very crucial role in supply chain management systems. Products and services sold to the end user are created with the help of different sets of raw materials. It is therefore necessary that suitable quality raw materials are procured at cost effective rates. If a supplier is unable to supply on time, and within the stipulated budget, the business is bound to suffer losses and gain a negative reputation.

It is crucial that a company procures good quality resources so it can create good quality products and maintain its reputation in the market. This necessitates a strong role for suppliers in the supply chain management system.

Inventory

For a highly effective supply chain management system it is essential that an inventory is kept and thoroughly maintained. An inventory means the ready list of items, raw materials and other essentials required for the product or service. This list has to be regularly updated to demarcate available stock and required stock. Inventory management is critical to the function of supply chain management, because without proper inventory management the production, as well as sale of the product, is not possible. Businesses have now started to pay more attention to this component simply because of its impact on the supply chain.

Production

Production is one among the most important aspects of this system. It is only possible when all the other components of the supply chain are in tandem with each other. For the process of production to start it is essential that proper planning and supplies of goods, as well as the inventory, are well maintained. The production of goods is followed by testing, packaging and the final preparation for delivery of the finished product.

Location

Any business, that wants to survive as well as flourish, needs a location which is profitable for the business. Take for example; a carbonated drink factory is set up in an area where water supply is scarce. Water is a basic necessity of such business. The lack of water could hamper the production as well as affect the goodwill of the company. A business cannot survive if it has to share an already scarce raw material with the community. Hence, a suitable location, which is well connected, and very close to the source of essential resources for production is vital to a business' prosperity. The requirement and availability of manpower must also be considered while setting up a business unit.

Transportation

Transportation is vital in terms of carrying raw materials to the manufacturing unit and delivering the final product to the market. At each stage, timely transportation of goods is mandatory to sustain a smooth business process. Any business which pays attention to this component, and takes good care of it, will benefit from the production and transportation of its goods on time.

It is essential that a company works towards a safe and secure transportation process. Be it in-house or a third-party vendor, the transportation management system must ensure zero damage and minimal loss in transit. Well-managed logistics systems along with flawless invoicing are the two pillars of secure transportation.

Return of Goods

Among the various components that create a strong supply chain is the facility for the return of faulty/malfunctioning goods, along with a highly responsive consumer grievance redress unit.

No one is infallible. Even a machine may malfunction once in a million times if not more. As a part of a strong business process, one may expect the return of goods under various circumstances. Even the best quality control processes may have unavoidable momentary lapses. In the case of such lapses, inevitably followed by consumer complaints, a business must, instinctively, recall the product/s and issue an apology. This not only creates a good customer bonding, but also maintains goodwill in the long run.

The eight components discussed here are interdependent and ensure a smooth supply chain management system. It ensures the success and reputation of a business. A business must focus on all these components in order to create a flawless supply chain.

Businesses that have a strong supply chain management system in place always put great emphasis on all the components listed, and also ensure that management, as well as the teams at various levels, play by the rules. Profit is the bottom line and to make sure that the business achieves it, it is essential that the supply chain does not have any gaps. Any snag should be dealt with immediately and the weak links repaired or removed.

Demand and supply are two of the most important aspects of a business. For any business to be successful, trends, with respect to demand and supply, need to be studied carefully while implementing an effective plan of execution. A supply chain management system is required not just for the timely manufacture of goods; it is also a very critical system for ensuring that consumer requirements are met effectively.

Importance of Supply Chain Management

SCM activities can improve customer service. Effective supply chain management has the ability to ensure customer satisfaction by making certain the necessary products are available at the correct location at the right time. SCM can also increase customer satisfaction by delivering products to consumers on time and providing fast service and support whenever needed. By increasing customer satisfaction levels, enterprises are able to build and improve customer loyalty, making the boost in customer service important for both the customer and business.

SCM also provides a major advantage for companies by decreasing the overall operating costs. SCM activities can reduce purchasing cost, production cost and total supply chain cost. By lessening operating costs, SCM is also able to improve a company's financial position. The reduced supply chain costs can greatly increase a business's profits and cash flow. Furthermore, SCM can diminish

the use of large fixed assets - such as warehouses and transportation vehicles - by allowing supply chain experts to redesign their network in order to properly serve and operate with five warehouses instead of eight, reducing the cost of owning an additional three facilities.

The lesser known importance of SCM can be found in its critical role in society. SCM can help ensure human survival by improving healthcare, protecting humans from climate extremes and sustaining human life. Humans rely on supply chains to deliver necessities like food and water as well as medicines and healthcare. The supply chain is also vital to the delivery of electricity to homes and businesses, providing the energy needed for light, heat, air conditioning and refrigeration.

SCM can also improve the overall quality of life by fostering job creation, providing a foundation for economic growth and improving standards of living. A multitude of job opportunities are opened up since supply chain professionals design and control all of the supply chains in a society as well as manage inventory control, warehousing, packaging and logistics. Furthermore, one commonality between most poor nations is their lack of a developed supply chain. Societies with strong, developed supply chain infrastructures - such as large railroad networks, interstate highway systems and an array of airports and modern ports - can efficiently exchange goods at lower costs, allowing consumers to buy more products, thus providing economic growth and increasing the standard of living in the respective society.

Supply Chain Complexity

The most basic version of a supply chain includes a company, its suppliers and the customers of that company. The chain could look like this: raw material producer, manufacturer, distributor, retailer and retail customer.

A more complex, or extended, supply chain will likely include a number of suppliers and suppliers' suppliers, a number of customers and customers' customers - or final customers - and all the organizations that offer the services required to effectively get products to customers, including third-party logistics providers, financial organizations, supply chain software vendors and marketing research providers. These entities also use services from other providers.

The totality of these organizations, which evokes the metaphor of an interrelated web rather than a linear chain, gives insight into why supply chain management is so complex. That complexity also hints at the types of issues that can arise, from demand management issues, such as a release of a new iPhone that chokes demand for old iPhone cases; to natural supply chain disruptions, such as the halt of transportation in the U.S. in 2015 due to extreme winter weather, or California's drought and its effect on crops; to political upheaval.

The Role of Supply Chain Management Software

Technology is critical in managing today's supply chains, and ERP vendors offer modules that focus on relevant areas. There are also business software vendors that focus specifically on SCM. A few important areas to note include:

- Supply chain planning software for activities such as demand management.
- Supply chain execution software for activities such as day-to-day manufacturing operations.

- Supply chain visibility software for tasks such as spotting and anticipating risks and proactively managing them.
- Inventory management software for tasks such as tracking and optimizing inventory levels.
- Logistics management software and transportation management systems for activities such as managing the transport of goods, especially across global supply chains.
- Warehouse management systems for activities related to warehouse operations.

Infor, JDA Software, Oracle and SAP are well-known vendors of supply chain software.

The increasingly global nature of today's supply chains and the rise of e-commerce, with its focus on nearly instant small deliveries straight to consumers, are posing challenges, particularly in the area of logistics and demand planning. A number of strategies - such as lean - and newer approaches - such as demand-driven material requirements planning - may prove helpful.

Technology - especially big data, predictive analytics, and internet of things (IoT) technology, supply chain analytics, robotics and autonomous vehicles - is also being used to help solve modern challenges, including in the areas of supply chain risk and disruption and supply chain sustainability.

As just two examples, IoT can help with transparency and traceability to help boost food quality and safety by using sensors to monitor the temperature of perishable food while it's in transit. And analytics can help determine where to put smart lockers in densely populated areas to cut the number of single-item deliveries and lower greenhouse gas emissions.

It is well known that supply chain management is an integral part of most businesses and is essential to company success and customer satisfaction.

Reduce Operating Costs

- **Decreases Purchasing Cost** – Retailers depend on supply chains to quickly deliver expensive products to avoid holding costly inventories in stores any longer than necessary. For example, electronics stores require fast delivery of 60" flat-panel plasma HDTV's to avoid high inventory costs.
- **Decreases Production Cost** – Manufacturers depend on supply chains to reliably deliver materials to assembly plants to avoid material shortages that would shut down production. For example, an unexpected parts shipment delay that causes an auto assembly plant shut-down can cost \$20,000 per minute and millions of dollars per day in lost wages.
- **Decreases Total Supply Chain Cost** – Manufacturers and retailers depend on supply chain managers to design networks that meet customer service goals at the least total cost. Efficient supply chains enable a firm to be more competitive in the market place. For example, Dell's revolutionary computer supply chain approach involved making each computer based on a specific customer order, then shipping the computer directly to the customer. As a result, Dell was able to avoid having large computer inventories sitting in warehouses and retail stores which saved millions of dollars. Also, Dell avoided carrying computer inventories that could become technologically obsolete as computer technology changed rapidly.

Improve Financial Position

- **Increases Profit Leverage** – Firms value supply chain managers because they help control and reduce supply chain costs. This can result in dramatic increases in firm profits. For instance, U.S. consumers eat 2.7 billion packages of cereal annually, so decreasing U.S. cereal supply chain costs just one cent per cereal box would result in \$13 million dollars saved industry-wide as 13 billion boxes of cereal flowed through the improved supply chain over a five year period.
- **Decreases Fixed Assets** – Firms value supply chain managers because they decrease the use of large fixed assets such as plants, warehouses and transportation vehicles in the supply chain. If supply chain experts can redesign the network to properly serve U.S. customers from six warehouses rather than ten, the firm will avoid building four very expensive buildings.
- **Increases Cash Flow** – Firms value supply chain managers because they speed up product flows to customers. For example, if a firm can make and deliver a product to a customer in 10 days rather than 70 days, it can invoice the customer 60 days sooner.

Lesser known, is how supply chain management also plays a critical role in society. SCM knowledge and capabilities can be used to support medical missions, conduct disaster relief operations, and handle other types of emergencies.

Whether dealing with day-to-day product flows or dealing with an unexpected natural disaster, supply chain experts roll up their sleeves and get busy. They diagnose problems, creatively work around disruptions, and figure out how to move essential products to people in need as efficiently as possible.

Societal Roles of SCM

Ensure Human Survival

- **SCM Helps Sustain Human Life** – Humans depend on supply chains to deliver basic necessities such as food and water. Any breakdown of these delivery pipelines quickly threatens human life. For example, in 2005, Hurricane Katrina flooded New Orleans, LA leaving the residents without a way to get food or clean water. As a result, a massive rescue of the inhabitants had to be made. During the first weekend of the rescue effort, 1.9 million meals and 6.7 million liters of water were delivered.
- **SCM Improves Human Healthcare** – Humans depend on supply chains to deliver medicines and healthcare. During a medical emergency, supply chain performance can be the difference between life and death. For example, medical rescue helicopters can save lives by quickly transporting accident victims to hospitals for emergency medical treatment. In addition, the medicines and equipment necessary for treatment will be available at the hospital as a result of excellent supply chain execution.
- **SCM Protects Humans from Climate Extremes** – Humans depend on an energy supply chain to deliver electrical energy to homes and businesses for light, heat, refrigeration and air conditioning. Logistical failure (a power blackout) can quickly result in a threat to human life. For example, during a massive East Coast ice storm in January 1998, 80,000 miles of electrical power lines fell resulting in no electricity for 3,200,000 Montreal, Quebec

residents. Due to extreme cold, 30 died and 25% of all Quebec residents left home to seek heated shelter. In addition, economic costs included \$3 billion in lost business, \$1 billion in home damage and \$1 billion in government expenditures.

Improve Quality of Life

- **Foundation for Economic Growth** – Societies with a highly developed supply chain infrastructure (modern interstate highway system, vast railroad network, numerous modern ports and airports) are able to exchange many goods between businesses and consumers quickly and at low cost. As a result, the economy grows. In fact, the one thing that most poor nations have in common is no or a very poorly developed supply chain infrastructure.
- **Improves Standard of Living** – Societies with a highly developed supply chain infrastructure (modern interstate highway system, vast railroad network, numerous modern ports and airports) are able to exchange many goods between businesses and consumers quickly and at low cost. As a result, consumers can afford to buy more products with their income thereby raising the standard of living in the society. For instance, it is estimated that supply chain costs make up 20% of a product's cost in the U.S. but 40% of a product's cost in China. If transport damage is added in, these costs make up 60% of a product's cost in China. The high Chinese supply chain cost is a major impediment to improving the standard of living for Chinese citizens. Consequently, China has embarked on a massive effort to develop its infrastructure.
- **Job Creation** – Supply chain professionals design and operate all of the supply chains in a society and manage transportation, warehousing, inventory management, packaging and logistics information. As a result, there are many jobs in the supply chain field. For example, in the U.S. logistics activities represent 9.9% of all dollars spent on goods and services in 2006. This translates into 10,000,000 U.S. logistics jobs.
- **Opportunity to Decrease Pollution** – Supply chain activities require packaging and product transportation. As a by-product of these activities, some unwanted environmental pollutants such as cardboard waste and carbon dioxide fuel emissions are generated. For example, paper and paperboard accounted for 34% of U.S. landfill waste in 2005. Only 50% of the 84 million tons of paper and paperboard waste were recycled. Also, carbon dioxide emissions from transportation accounted for 33% of total U.S. CO₂ emissions in 2005. As designers of the network, supply chain professionals are in a key position to develop more sustainable processes and methods.
- **Opportunity to Decrease Energy Use** – Supply chain activities involve both human and product transportation. As a by-product of these activities, scarce energy is depleted. For example, currently transportation accounts for 30% of world energy use and 95% of global oil consumption. As designers of the network, supply chain professionals have the role of developing energy-efficient supply chains that use fewer resources.

Protect Cultural Freedom and Development

- **Defending Human Freedom** – Citizens of a country depend on military logistics to defend their way of life from those who seek to end it. Military logisticians strategically locate

aircraft, ships, tanks, missiles and other weapons in positions that provide maximum security to soldiers and other citizens. Also, superior logistics performance yields military victory. For example, the B-2 Stealth Bomber is able to deliver bombs to target without being detected by enemy radar.

- Protects Delivery of Necessities – Citizens of a country depend on supply chain managers to design and operate food, medicine and water supply chains that protect products from tampering. Sophisticated packaging techniques, state of the art surveillance cameras, global positioning systems and RFID inventory tracking are some of the methods used to deter terrorists from accessing these vital logistics systems.

Logistics in Supply Chain Management

The supply chain is about “moving” - or “transforming” - raw materials and ideas into products or services and getting them to customers. Well the question is, what is logistics management? in supply chain. Logistics is about moving materials or goods from one place to another. Logistics is, in that sense, the servant of design, production, and marketing. But it is a servant that can bring added value by quickly and effectively doing its job. The following areas of logistics management contribute to an integrated approach to logistics within supply chain management.

Figure below combines several perspectives to illustrate what is logistics, in a broader scope.



Transportation

Many modes of transportation play a role in the movement of goods through supply chains: air, rail, road, water, pipeline. Selecting the most efficient combination of these modes can measurably improve the value created for customers by cutting delivery costs, improving the speed of delivery, and reducing damage to products.

Warehousing

When inventory is not on the move between locations, it may have to spend some time in a warehouse. Warehousing is “the activities related to receiving, storing, and shipping materials to and from production or distribution locations. It is a very important factor, we need to consider to know what is logistics.”

Third- and Fourth-Party Logistics

Like other aspects of supply chain management, the various logistics functions can be outsourced to firms that specialize in some or all of these services. Third-party logistics providers (3PLs) actually perform or manage one or more logistics services. Fourth-party providers (4PLs) are logistics specialists and play the role of general contractor by taking over the entire logistics function for an organization and coordinating the combination of divisions or subcontractors necessary to perform the specific tasks involved. This growing trend incorporates the supply chain management philosophy of concentrating on core competencies and partnering with other firms to perform in areas outside your competence.

Logistics in Reverse Logistics (or the Reverse Supply Chain)

Another growing area of supply chain management is reverse logistics, or how best to handle the return, reuse, recycling, or disposal of products that make the reverse journey from the customer to the supplier. This business can be handled at a loss, or it can actually become a profit center.

Functions of Supply Chain Management

Supply chain management maintains the balance between the demand and supply and involves activities right from procurement of materials and converting them into finished goods to ensuring delivery at the right time to reach the end-consumer. Hence, supply chain management is the lifeline of an organization. It needs to be really efficient to keep the operations running like a well-oiled machine. A streamlined supply chain management chain can enhance customer relationship, lower down operational costs.

The global supply chain management primarily comprises five functions mentioned below:

Purchasing

This is the first function of supply chain management. It pertains to procuring raw materials and other resources that are required to manufacture the goods. It requires coordination with suppliers to deliver the materials without any delays.

Operations

The operation team engages in demand planning and forecasting. Before giving raw material purchase order, the organization has to anticipate the possible market demand and number of units it needs to produce. Accordingly, it further sets the ball rolling for inventory management, production and shipping. If the demand is over anticipated, then it could result in excess inventory cost. If the demand is under anticipated, the organization wouldn't be able to meet customer demand, thereby leading to revenue loss. So, operations function plays a critical role in supply chain management.

Logistics

This function of supply chain management requires immense coordination. The manufacturing of products has commenced. It needs space for storage until it is shipped for delivery. This calls

for making local warehouse arrangements. Let's say; the products are to be delivered outside the city, state or country limits. This brings transportation in the loop. There will also be a need for outstation warehouses. Logistics ensures that products reach the end-point delivery without any glitches.

Resource Management

Any production consumes raw materials, technology, time and labour. However, all the processes need to be efficient and effective. This phase is taken care by the resource management function team. It decides the allocation of resources in the right activity at the right time to optimize the production at reduced costs.

Information Workflow

Information sharing and distribution is what really keeps all other functions of supply chain management on track. If the information workflow and communication are poor, it could break apart the entire chain and lead to mismanagement.

Core Functions of SCM

Even though primarily SCM is concerned with suppliers and the proper movement of raw material into the organisation, it is increasingly adopting areas that are crucial for customer satisfaction. Some of the important functions of supply chain management are:

- Management of suppliers
- Management of Raw Material
- Transportation Management
- Information Management
- Tracking and Monitoring
- Cost Management
- Inventory Management
- Distribution and Return Management
- Management of Supply Chains
- Customer Satisfaction

Connectivity of Different Functions

Many of the internal processes of a company are linked with the external processes. These areas are interconnected and affect profits, costs and customer satisfaction. For example, the raw material reaches the manufacturer from the supplier(s) using transportation. Even in this simple chain, many factors such as inventory management, transportation management, knowledge management, tracking, monitoring, and cost management are conducted.

That is how in a simple transfer of raw material from the supplier to the manufacturer, the management of various areas is required. Due to this interaction and inter-dependence of different functions, a cross-functional approach is used in SCM.



Collaboration

Outsourcing of Functions

Globalisation has drastically changed how we work. Businesses have taken advantage of technology to outsource work that can be done at reduced costs. Distribution of ownership of functions is increasingly becoming key to growth and expansion. In a changing environment, supply chain management involves more than management of suppliers. It also involves outsourcing of functions that can be done better, and at lower costs, by others.

Outsourcing of functions does not necessarily mean lack of control. With sophisticated tracking and monitoring methods, manufacturers can easily control functions even if they are carried out by other companies. The function of SCM here becomes more expansive, challenging and fruitful.

Areas of Supply Chain

Supply chain is a very broad field; it has seven primary functional areas. They are: Purchasing, Manufacturing, Inventory Management, Demand Planning, Warehousing, Transportation, and Customer Service. These areas may appear to be independent functions, but in an efficient supply chain, they must interact to a great degree and are very dependent upon one another.

Purchasing

The activity of acquiring goods or services to accomplish the goals of an organization. The major objectives of purchasing are to:

1. Maintain the quality and value of a company's products,
2. Minimize cash tied up in inventory,

3. Maintain the flow of inputs to ensure the flow of outputs,
4. Strengthen the organization's competitive position.

Purchasing may also involve:

1. Development and review of the product specifications,
2. Receipt and processing of requisitions,
3. Advertising for bids,
4. Bid evaluation,
5. Award of supply contracts,
6. Inspection of good received,
7. Their appropriate storage and release.

The purchasing function is core to any company, as it provides the materials and resources needed to create a product. As the economy becomes more global, the opportunities become even more exciting. The roles that exist within this function are numerous, and here are just a few: coordinator or analyst, materials manager, corporate purchasing manager. These roles can exist at a field location such as a plant or at a corporate location. Depending on the company, individuals could be involved in purchasing anything from office supplies to parts for the construction of airplane engines.

Manufacturing

Manufacturing is the production of merchandise for use or sale using labour and machines, tools, chemical and biological processing, or formulation. The term may refer to a range of human activity, from handicraft to high tech, but is most commonly applied to industrial production, in which raw materials are transformed into finished goods on a large scale. Such finished goods may be used for manufacturing other, more complex products, such as aircraft, household appliances or automobiles, or sold to wholesalers, who in turn sell them to retailers, who then sell them to end users and consumers.

The manufacturing function has received a lot of notice in the press as companies move various production operations overseas. Despite this, there are still many job opportunities available. These include: production planner, production manager, corporate manager of production planning, plant manager, line operator, machine operator, QA analyst, or engineer. Manufacturing will always play a key role in the US economy as many products will always be produced here. From food to cars, companies will continue to manufacture in the US because of the skilled workforce and natural resources available.

Inventory Management

Activities employed in maintaining the optimum number or amount of each inventory item.

The objective of inventory management is to provide uninterrupted production, sales, and/or customer-service levels at the minimum cost. Since for many companies inventory is the largest item in the current assets category, inventory problems can and do contribute to losses or even business failures.

The management of inventory is a key function of any manufacturing company, whether domestic or foreign. Physical inventory is often one of the most significant assets of a company, and without it, a company would have no sales. It's important to have the right product, at the right place at the right price, and inventory allows this to occur. In today's global economy the inventory function has become more important and challenging as product can be produced and available anywhere in the world.

Demand Planning

Demand Planning is the process of forecasting customer demand to drive execution of such demand by corporate supply chain and business management. Demand forecasting involves techniques including both informal methods, such as educated guesses, and quantitative methods, such as the use of historical sales data and statistical techniques or current data from test markets. Demand forecasting may be used in production planning, inventory management, and at times in assessing future capacity requirements, or in making decisions on whether to enter a new market.

Demand forecasting is predicting future demand for the product. In other words it refers to the prediction of probable demand for a product or a service on the basis of the past events and prevailing trends in the present.

Demand planning today requires analytical skills and a love of computer modeling. It helps if you have a crystal ball, but since few people do, the art and science of forecasting what people will buy, or what components you will need, or what trends will impact the sales of your product is left to those who can analyze and interpret data effectively.

Warehousing

Performance of administrative and physical functions associated with storage of goods and materials. These functions include receipt, identification, inspection, verification, putting away, retrieval for issue, etc.

While many people view the function of warehousing as the simple process of storing products, it has evolved into a function that does more than that. In today's world of mass customization, the warehouse has evolved into a distribution center, and even a facility to customize the final product via repacking, labeling or other physical conversion. The importance of these facilities has grown as it's the final "stop" before moving to the customer. Proper handling, storage and management of the products within these facilities must occur so that customer orders can be fulfilled with the right product at the right time.

Transportation

Transportation is the movement of people, animals and goods from one location to another. Modes of transport include air, rail, road, water, cable, pipeline and space. The field can be divided into infrastructure, vehicles and operations. Transport is important because it enables trade between persons, which is essential for the development of civilizations.

The transportation function is critical to the supply chain because it is where the rubber literally

meets the road. A company can have the right product at the right warehouse at the right time, but without transportation it won't make it to the customer at the right time. In today's global economy, this function is even more critical as it's no longer as easy as putting a product on a truck and having it delivered. Now it might be shipped via container ship, airplane, train, truck or even uber car before arriving at the customer. Companies have to evaluate the many different dimensions of each option such as cost, speed, reliability and ability to service when deciding which to utilize.

Customer Service

The process of ensuring customer satisfaction with a product or service. Often, customer service takes place while performing a transaction for the customer, such as making a sale or returning an item. Customer service can take the form of an in-person interaction, a phone call, self-service systems, or by other means.

While the customer service function appears to be at the end of the supply chain, it is definitely not the end of the process. This function is critical in that it works to meet the needs of the customer and ensure the customer receives what they want, when they want it. This function is sometimes the only point of contact a customer has with a company so it's imperative that they have the skills and knowledge to understand a customer's needs and to meet those needs when possible.

Supply Chain Optimization

With any supply chain, there is always room for improvement. Whether it be bottleneck elimination, cost management, or a new system integration, project managers are attempting to locate various ways in which they can optimize their supply chain.

Supply chain optimization methods will permit your manufacturing operation to come closer to overall production and factory efficiency, leading to reductions within time and cost. Furthermore, here are five ways you are able to optimize your supply chain.

Inventory Control

Being fully aware of your inventory not only reduces cost, but it will enhance delivery time as well. Inventory accuracy is a must for any manufacturing operation that wants to expand their consumer base and target market. Delivery times are important to all consumers, and if the materials or product do not show up on time, then the entire supply chain can fall out of whack, leading to lost time and revenue.

Supplier Inventory Management

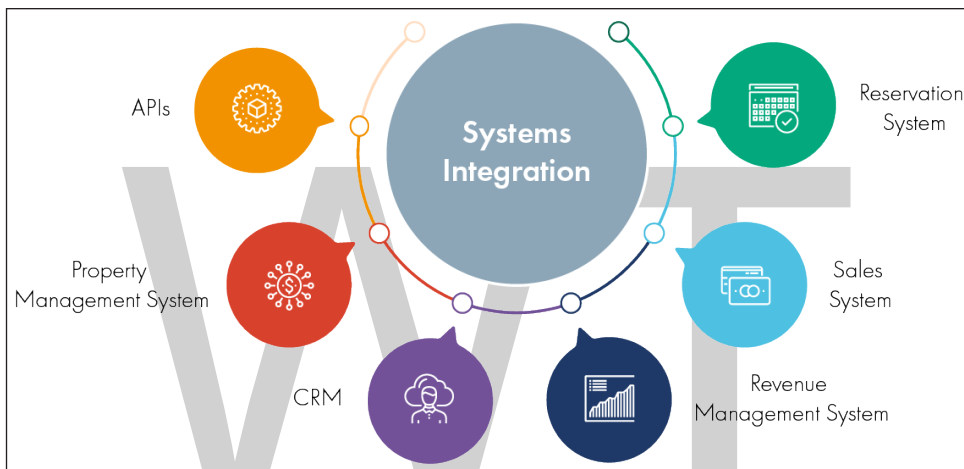
Establishing a favorable relationship with your supplier will enable open communication. Through open communication, you can share information about customer demand and inventory, which may optimize your demand planning. As both you and the supplier have the same goals (delivery time accuracy), being open and sharing information with your supplier will permit a steady flow within your supply chain.

Demand Planning

Demand planning is vital within supply chain. To do this, you will need accurate customer forecasting and orders to develop a successful demand plan. This will lead to cost and inventory reduction within your supply chain, ultimately leading to an increase in revenue. In modern manufacturing, demand planning has become much simpler with implementation of integrated systems.

System Integration

Modern Manufacturers cannot reach full potential without integrating an accurate and efficient system. Whether it is an enterprise resource planning system (ERP) or installing advanced planning and scheduling software (APS), gradually witness the improvements in production through systemic accountability and optimization.



These systems can account for various areas of the supply chain such as demand planning, capacity planning, inventory management, and production control.

Advanced Planning and Scheduling (APS) Software in Supply Chain Optimization

Advanced planning and scheduling software (APS) offers as an extension to your ERP system. Through various benefits and capabilities such as capacity planning, “what-if” scenarios, and demand planning, quickly optimize production and reduce cost within your supply chain. Some of the benefits of advanced planning and scheduling include the following:

- Improved Delivery Performance
- Boosts in Profits
- Reduction in Inventory and Labor Cost
- Six month ROI

With the perks of simple integration, an advanced planning and scheduling (APS) system will turn your manufacturing operation into a profit center and put you a step above competitors. APS is a true part of SCM and SCP is no many ways.

Supply Chain Security

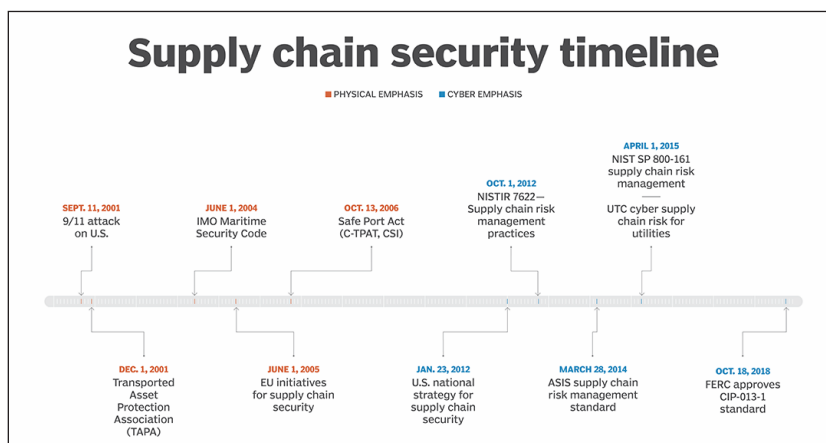
Supply chain security is the part of supply chain management (SCM) that focuses on minimizing risk for supply chain, logistics and transportation management systems (TMS). The goal of supply chain security is to identify, assess and prioritize efforts to manage risk by layered defenses in an agile manner. This requires a multifaceted approach to protecting the checkpoints, assets and infrastructures involved with the production of a product. Supply chain security also takes into account the protocols set by government agencies, like homeland security or customs regulations for international supply chains.

The first step in supply chain security is to identify any potential weaknesses in a system. Overall organizational risk management practices should then be adjusted to accommodate and address those weaknesses. Collaboration with a 3PL provider can also help organizations find vulnerabilities and make improvements within a supply chain.

Examples of Supply Chain Security Activities

A few examples of security procedures that can be put into place to make supply chains more secure include:

- Verifying proper credentials for all participants within a supply chain.
- Screening all of the contents within a cargo that is being shipped.
- Notifying recipients of shipments in advance.
- Securing the cargo in transit or storage with the use of access controls, alarms, locks, and surveillance or tamper-proof seals.
- Inspecting cargo at each stage of the supply chain or shipment process.
- Completing background checks on all employees.
- Meeting all compliance and security standards.
- Conducting regular risk assessments of supply chain segments, vendors and partners.
- Training employees to identify and resolve supply chain security risks.



Importance of Supply Chain Security

Supply chain security should be a high priority for organizations as a breach within the system could damage or disrupt operations. Vulnerabilities within a supply chain could lead to unnecessary costs, inefficient delivery schedules and a loss of intellectual property. Additionally, delivering products that have been tampered with or unauthorized could be harmful to customers and lead to unwanted lawsuits.

Security management systems can help protect supply chains from physical and cyber threats. Physical threats encompass risks with internal and external sources, such as theft, sabotage and terrorism, while cyber threats refer to vulnerabilities in IT and software systems, like malware attacks, piracy and unauthorized ERP access. While threats cannot be completely erased, supply chain security can work towards a more secure, efficient movement of goods that can recover rapidly from disruptions.

Supply Chain Security Management System

ISO 28000 SMS outlines the requirements to enable an organization to establish, implement, maintain and improve a security management system, including those aspects critical to security assurance of the supply chain. These aspects include, but Supply risks such as threats from terrorism, fraud and piracy have serious implications to businesses. Throughout the supply chain, organizations must manage these risks and assure security by identifying potential threats, assessing risks and implementing measures to prevent any risks and threats from adversely affecting the success of their businesses.

This standard can be applied by organizations of all sizes involved in manufacturing, service, storage or transportation at any stage of the production or supply chain.

Understanding the right certification for your business is of utmost importance. You need to know the characteristics of your business and the key performance metrics for it. If your business has a supply chain though, you would want a Supply Chain Security management system.

Every business around the globe wants to have a quality check at every activity within its company. There should be process to make sure that quality work is being done at all points of time. Of course, having routine checks and monitoring methods are a way to get this done, but is it the most efficient and fruitful? There are many certifications offered today and the key to having a successful quality system is by knowing the right certification that is needed for your business. There are many factors that revolve around the choice of a quality system but understanding them is the key. For example, if your business has a supply chain within it, you would be better off detecting the different threat points that are present in the system. A slip in any one of the processes and you could face severe damage either in property or even in finance. Having a security management certification for the supply chain is a simple way to maintain a secure environment for your business.

Security Management Certification for the Supply Chain

Quite simply, it is a certification that specifies the needs of a security management system that is made specifically for a business's supply chain. It takes note of all the direct impacts to the company and even the indirect impacts made.

We at IRQS understand the value of having a security management certification for the supply chain for your business and the value addition it will give you.

Having an ISO 28000 Certification would help you boost your presence and brand value in multiple ways. It would help you reach out to a bigger audience and also improve the efficiency of the system in your company. These qualities will ensure your business thrives in the market like never before.

Benefits of Supply Chain Management System

What quality standard would be best for your business? There are many certifications that are being offered today to boost the levels of efficiency in your company, but knowing which quality system would do the best for you is a task in itself. You must research well about the different possibilities that would match their business needs. For example, if your business is one that revolves around the functionality of a supply chain, you would be better off having the right security in place to ensure it is protected.

Many people may not know it, but an ISO 28000 certification can help your business in many ways. Having implemented many certifications over the last few years, IRQS has the know-how on quality standards and their benefits. Here are a few benefits of Security Management Certification for the Supply Chain:

- **Assurance on quality:** Any customer that you interact with will know that you provide quality in the market. Having this form of brand image cannot have a price upon it. A simple reason behind this advantage is that your company is focused towards delivering quality service and products at every time.
- **Better marketing possibilities:** A Security Management Certification for the Supply Chain would reduce the number of clients you lose and also help you grow on business, people would want to work with you because of the quality you bring to the table. You would be able to market the product extremely easily because of the quality promises. Retention of clientele is always important for a company you can achieve this easily with a quality standard.
- **Improve profitability:** With a Security Management Certification for the Supply Chain, The entire supply chain would be visible with its possible threat points, thus you can improve the profitability at any point of time.

These benefits of Security Management Certification for the Supply Chain make it the most sought after quality standard in today's world.

Supply Chain Collaboration

Supply chain collaboration is not a fancy term for knowledge sharing, although it does require multiple organisations in a supply chain to make intelligence available to one another.

Supply chain collaboration does not mean systems integration, even though integrating IT platforms with partners certainly makes collaboration more practical.

So what is supply chain collaboration, really? In a nutshell, it's what happens when two or more discrete organisations work closely together to meet shared objectives. These objectives are typically focused on cost reduction, customer service improvement, or raising specific aspects of supply chain performance.



Parties Involved in Supply Chain Collaboration

Quite simply, any two or more companies dependent on one another to supply an end-customer should be prepared to collaborate. For example:

- A retailer might collaborate with a wholesaler or manufacturer from which it purchases goods.
- A manufacturer might collaborate with a raw materials supplier to add value for its end-customers.
- A raw materials supplier might collaborate with one or more transport companies to generate service and cost benefits for its largest manufacturing customers.

In an ideal world, every agency involved in turning raw materials into goods, selling them, and distributing them to business customers or consumers would collaborate, thus maximising supply chain cost-effectiveness and reliability. As yet though, that degree of collaboration is more likely to be the exception than the rule.

Importance of Supply Chain Collaboration

There was a time when supply chains were, in the main, vertically oriented. A single company might have owned the processes of raw material sourcing, manufacturing, distribution, sales, and marketing, with the entire supply chain falling under the direct control of that one enterprise.

The same is rarely true today. Most supply chains are decentralised, sometimes involving dozens of companies, all playing different roles in the demand/supply cycle. With no single entity having complete control of materials, resources, strategy, or service quality, collaboration is the only way to unify the supply chain.

However the concept of supply chain collaboration is not yet mature. In many cases, supply chains still comprise a mix of companies, some of which collaborate with one another, while others maintain traditional supplier/buyer relationships.



Evolution of Supply Chain Collaboration

As more organisations recognise the need to collaborate, a whole new culture is evolving. This is why collaboration has become such a familiar buzzword in the supply chain world. But true collaboration is not an easy state to arrive at. Boundaries of mistrust must be broken down and conflicting objectives must somehow be transformed into aligned goals.

Steady progress is being made though, aided by web technology that helps companies share information, systems integration for seamless supply chain handoffs, and perhaps most importantly, by the fearlessness of pioneering organisations.

These brave leaders in supply chain collaboration are neither afraid to share supply chain risks or too self-serving to share the rewards. They show us how collaborative supply chains thrive and prosper, ensuring that the concept continues to gain acceptance and popularity.

Steps to Successful Collaboration

Collaborate in Areas where you have a Solid Footing

Companies are often tempted to use collaboration as a way to fill gaps in their own capabilities. In practice, the most successful collaborations build on strengths rather than compensating for weaknesses. A manufacturer seeking to collaborate with a major retailer in order to improve its own forecasting performance, for example, will have little to gain from access to the retailer's point-of-sale data unless it has the in-house analytical capability to make effective use of that data. Similarly, there is little point in entering collaborations to boost sales if any increase in demand is likely to run into manufacturing-capacity constraints.

Potential collaborators should also be sure they have the right supporting infrastructure in place in advance of any collaborative effort. Is the top management committed to the collaboration process and ready to offer support over the long term. Are inhouse information technology (IT) systems robust enough to facilitate real-time data sharing if required.

Turn Win-Lose Situations into Win-Win Opportunities with the Right Benefit-Sharing Model

Some collaborations promise equal benefits for both parties. If, for example, a manufacturer and a retailer collaborate to optimize product mix, both could expect to benefit from the resulting increase in sales. In other cases, however, the collaboration might create as much value overall but

the benefit could fall more to one partner than to the other. Here's one real-life example: a retailer and a manufacturer were able to reduce overall logistics costs between factory and store by cutting out the manufacturer's distribution centers and treating the retailer's distribution network as one integrated supply chain, from manufacturing plant to store shelf. However, the retailer's supply chain executives struggled to gain acceptance for the idea from their leadership because it resulted in the retailer carrying a far larger fraction of the logistics cost.

Rather than shying away from such asymmetric collaborations, smart companies can make them work by agreeing on more sophisticated benefit-sharing models. These can come in the form of discounts or price increases to more fairly share increased margins or cost reductions, or they can involve compensation in other parts of the relationship. For example, when one retailer collaborated with a manufacturer on a cobranded product line, the manufacturer agreed to absorb the upfront product-development costs in return for an expanded share of the retailer's product offerings across a wider set of categories.

Benefit sharing can help to overcome differences in strategic priorities, too. One growth-focused manufacturer was persuaded to join a supply chain waste reduction collaboration with a retailer by establishing an agreement to deposit part of the savings both companies achieved into a joint pool, which would then be invested in efforts to generate additional sales.

Similarly, in the product-flow improvement case described in the sidebar (page 6), the manufacturer provided the upfront investment in new retail-ready packaging, while its retail partner reaped most of the benefits in terms of increased availability and reduced labor costs. The two companies established a joint benefits pool and agreed to use a percentage of the savings to fund future cost-reduction efforts and a sales-improvement program.

Select Partners based on Capability, Strategic Goals and Value Potential

The biggest potential partner might not be the best one. Many companies aim to collaborate with their largest suppliers or customers because they assume that the greatest value is to be found there. In many cases, however, this turns out not to be true. Collaboration may be of more interest to a smaller partner, which might invest more time and effort in the program than a very large one that is already juggling dozens of similar initiatives.

A better approach is one that assesses current customers or suppliers across three key dimensions. First, is there enough potential value in collaborating with this partner to merit the effort? Both partners in a prospective collaboration need to be sure that it will deliver a sufficient return to justify the upfront investment. Second, do both partners have sufficiently common strategic interests to support the collaboration? A retailer that has prioritized growth in a particular region or segment will have more to gain from collaborating with a manufacturer that has a strong offering in the same area. Third, does the partner have the right infrastructure and processes in place to provide a basis for the collaboration? Collaborating to improve forecasting and demand planning is likely to be frustrating if one partner's existing planning processes, systems, or performance are inadequate.

Invest in the Right Infrastructure and People

Both manufacturers and retailers that participated in our research cited a lack of dedicated resources as one of the top three reasons for the failure of collaboration efforts. Companies frequently

underestimate the resources required to make collaborations work, assuming that staff in various functions can do what's required in addition to their other responsibilities.

In practice, even relatively simple collaborative tasks will be more difficult than equivalent activities conducted within the walls of the organization. That's because staff must overcome differences in culture, organization, and terminology, not to mention the basic challenge of finding the right contact within the partner organization with whom to liaise.

Disconnects within one organization can create problems, too. A "grassroots" collaboration started between two supply chain managers can lead to rapid performance improvements, only to be snuffed out when those higher in the organization fail to understand the initiative's potential. Alternatively, a collaboration agreement made between two board-level executives will fizzle out if the managers responsible for executing it think it is yet another short-lived senior management whim, if they can't see how the collaboration will help them achieve their own objectives, or if they lack the incentive to put additional effort into the project on top of their existing day-to-day roles.

To prevent both of these problems, best-practice companies devote extra resources to their collaborations, particularly in the early stages of a new relationship. Appropriate infrastructure for a successful collaboration begins at the top of the organization, with a steering committee of senior leaders who can set the defining vision for the collaborative effort and allocate resources to support it. The detailed design of the collaboration program is then completed by a team comprising members of all relevant functions from both partners in the collaboration. The team for a demand-planning effort, for example, should include members from sales, finance, and supply chain for the manufacturer, and from purchasing, merchandising, and store operations for the retailer. This team will also be responsible for the day-to-day monitoring of the effort once it is up and running.

Execution of the collaboration should take place within the line organization and will ultimately form part of the everyday responsibility of the staff assigned to it. The best companies avoid forcing their front-line staff to "reinvent the wheel" by providing strong support when establishing each new collaboration. They may, for example, leverage experience gained in previous collaborations by setting up teams to support their colleagues during the initial phase of subsequent efforts.

Establish a Joint Performance-Management System

An effective performance-management system helps a company to ensure that any long-term project is on track and delivering the results it should. In supply chain collaboration efforts, both participants should use the same performance-management system. By building common metrics and targets-and jointly monitoring progress-companies avoid the misaligned incentives that damage so many collaboration efforts.

Picking the right metrics can be challenging, however, and it will inevitably involve trade-offs. In a collaboration to reduce logistics costs, for example, the partners may have to choose between a pallet configuration that's optimized to suit a retailer's restocking processes, which will reduce in-store labor costs, and one that optimizes truck fill, which will reduce transportation costs from distribution center to retail store.

How to overcome these potential conflicts? The trick is to keep things simple by picking the smallest possible number of metrics required to give a picture of the collaboration's overall performance,

and then to manage those metrics closely, with regular joint reviews and problem-solving sessions to address trade-offs. The real power of any performance-management system comes from this frequent, robust dialogue between partners, yet this is also the element most commonly ignored or underemphasized by collaborating companies.

Collaborate for the Long Term

The final vital ingredient of a successful collaboration is stamina. It may take time and effort to overcome the initial hurdles and make a new collaboration work. Both parties need to recognize this and build an appropriate long-term perspective into their goals and expectations. This means including metrics that review performance beyond the first year, as well as conducting joint, long-term planning so both partners can understand each other's longer-term objectives and identify initiatives they can work on together over time. Such planning helps companies to break out of the short-term project mentality that can limit the beneficial impact of collaboration. Nevertheless, partners must also ensure that they are doing everything they can to capture any available quick wins, so the collaboration starts delivering value as quickly as possible.

When companies take a long-term perspective, their collaborative efforts can become a virtuous circle: a greater understanding of each other's capabilities, knowledge, and costs will often reveal new potential sources of value, while the experience of working closely together means that later initiatives will take less time and be easier to execute than early ones.

Supply Chain Diversification

Supply chain diversification is a manufacturing business terminology used to describe the act of increasing choices for when to order what supplies from whom to bring products to the market. In short, it describes the abundance and flexibility of the suppliers for a certain product. As in any business decision, there are advantages and disadvantages to having more or less diversity in the supply chain.

Supply chain diversification is not a simple method of making suppliers compete with each other for the best price. It is more about preparing one's supply chain to be flexible for any kind of problem that the market throws at you.

Simply having an abundance of suppliers does not mean that one has supply chain diversity. Each supplier must provide similar and/or equal products and be distinguishably competitive in such a way that each supplier is mutually exclusive under certain conditions. That is to say, supplier Alpha and supplier Beta both sell identical sprockets. Alpha sells each sprocket for \$1.00 a piece and can fulfill the order in 24 hours. Beta sells each sprocket for \$0.25 but they will take two weeks to fulfill. The trade-offs between time and cost is the decision one must make.

In diversifying the supply chain for one's products, it is also necessary to assist and educate the suppliers on what one expects from the suppliers and what one intends to do with the supplies. It becomes important to maintain an open line of communication with all the suppliers, and this in turn will increase the overhead necessary to maintain the managers/ reps for each supplier. To minimize the overhead involved, one may utilize a proceduralized method of developing a relationship with their suppliers such as RFPs and taking bids on jobs.

When doing business with multiple companies, such is the case here, it may become necessary to standardize one's paperwork – such as RFQs, and purchase orders. As price fixing is illegal in countries such as the United States, accountable paper trail management becomes a legal obligation for companies seeking supply chain diversification.

In the International market, import and export regulations may become a hurdle for finding the right suppliers to diversify ones supply chain. This is especially true for US businesses after 9/11. The US customs department has enacted new regulations such as C-TPAT to encourage trade. The extra time and money spent on certifying a supplier for regulations like C-TPAT is another trade-off that management must consider when diversifying their supply chain.

Legacy Suppliers

When diversifying your supply chain, the question arises, “What do we do with our old suppliers?” Because supply chain diversification cannot occur overnight, the legacy supplier must be involved throughout the transition phase. In most cases, the legacy supplier will remain as the primary supplier even after diversification, as there is usually good reason that they became the original supplier.

The most common cases of the original suppliers being phased out after diversification is when supplies were being provided in-house or the material provided by that supplier has become obsolete. This is usually not the case with third-party suppliers, as the market drives them to stay competitive.

As with any new supplier, communicating with the legacy suppliers of the new direction of one's company is important for a smooth transition. At first, legacy suppliers may be apprehensive about the diversification, as it brings competition to an otherwise dominated market. That is why it is important that each supplier is distinguished from one another and they are not in direct competition with each other. Otherwise, diversification may cause duplicated efforts, extra costs, and non-cooperation that the price savings may not be able to justify.

Supply Chain Diversification can Reduce Risk

There are many risks to supply chain continuity. Natural disasters, electronic attacks, politics, or the economy can make it so your usually reliable supplier can no longer meet your company's needs. Without a robust supply chain ready to pick up the slack, these disruptions can impact customer delivery, operations, or utilization-ultimately costing your company time and money. Supply chain diversification mitigates your risk by making sure you have a diverse supplier base, no matter what problem may arise.

Taking the time in advance to source, pre-qualify, and onboard multiple suppliers speeds up your response time when an incident occurs. This reduces the time and money lost to the disruption. But true diversification is more than just onboarding a bunch of new suppliers. In order to optimize your risk management, you must be strategic in the suppliers you choose.

For example, select a mix of large and small businesses, and include a range of geographical locations. Small businesses can be more agile and easier to work with, but what if they suddenly close their doors? That's why it's good to include a reputable large business that can easily step up.

Similarly, having all your suppliers in one region can cause huge issues if that area experiences a natural disaster. Think of the areas recently hit by Hurricanes Harvey and Irma, or remember Hurricane Sandy in 2012, Hurricane Katrina in 2005, or the earthquake and tsunami that struck Japan in 2011. These kinds of events are devastating and have long term effects on area businesses. Diversification is a vital component to your supply chain risk plan.

Supply chain diversification is more than a backup plan, however. You need a full range of trusted suppliers for more flexibility. Evaluating suppliers against one another ensures that you are getting the best value. Of course, this could be through cost savings. However, you can also compare other supplier performance metrics like shipping times or ability to meet regulatory compliance to select the right vendor for your needs. If your needs change, or the supplier's ability to meet them does, you can quickly and easily adapt.

For example, if you conduct a reverse auction to generate cost savings, a prequalified pool of suppliers to source against accelerates the auction time and reduces supplier disqualification post action.

When looking at the Aerospace and Defense industry, the problem is amplified. Suppliers must meet stringent DoD requirements, which means that the amount and type of suppliers is limited. The vetting process to insure your suppliers are compliant takes time.

Applying diversification tactics to validate and onboard will give you a huge strategic advantage and improve your business performance. The ability to source suppliers that meet this strict qualification not only strengthens your organization but creates significant value.

Adding more suppliers also adds a level of complexity to your supply chain. In order to realize the value of your diversified supply chain, you must manage it well. Make sure you have a process plan and work flow in place to handle the increase of suppliers.

For instance, Exostar offers Aerospace and Defense organization the opportunity to help secure and diversify their supply chains. They do this by on-boarding and evaluating thousands of suppliers simultaneously against our network of 100,000+ vetted suppliers. Furthermore, it provides access to a management dashboard which offers a comprehensive overview of the cyber-health of individual companies in their supply chain and where they stand related to current NIST 800-171 standards.

By taking steps toward supply chain diversification now, you can ensure you are getting the most value out of your supply chain and mitigate your risks for the future.

Supply Chain Risk-Management

Supply chain risk management (SCRM) is the coordinated efforts of an organization to help identify, monitor, detect and mitigate threats to supply chain continuity and profitability.

Threats to the supply chain include cost volatility, material shortages, supplier financial issues and failures and natural and manmade disasters. SCRM strategies and software help an organization

foresee potential issues and adapt to both those risks and unforeseeable supply chain disruptions as quickly and efficiently as possible.

Jason Busch and Sherry Gordon of Spend Matters (a global content network dedicated to procurement and supply chain issues) suggest the following best practices for supply chain risk management:

1. Automate processes involved in supplier risk management (SRM) to collect, analyze and manage supplier information.
2. Include supplier performance information in your analysis for insight into potential financial issues.
3. Identify red flags that may indicate problems and use technology to automate their early detection.
4. Integrate SCRM platforms with procurement and supply chain management (SCM) software systems including software for spend visibility, e-sourcing, purchase-to-pay, contract management and compliance.
5. Provide dashboards that track and report on supply risk metrics to give the executive team access to real-time observations into risk factors.

SCRM may require collaboration and coordination among an organization's sales, marketing, production, development, procurement, finance and IT departments.

Approach to Supply-Chain Risk Management

We recommend that organizations start by thinking of their risks in terms of known and unknown risks.

Known risks can be identified and are possible to measure and manage over time. For instance, a supplier bankruptcy leading to a disruption in supply would be a known risk. Its likelihood can be estimated based on the supplier's financial history and its impact on your organization can be quantified through consideration of the products and markets the supplier would disrupt. Newer risks such as cybersecurity vulnerabilities in the supply chain are also now quantifiable through systems that use outside-in analysis of a company's IT systems to quantify cybersecurity risks.

Organizations should invest time with a cross-functional team to catalog a full scope of risks they face, building a risk-management framework that determines which metrics are appropriate for measuring risks, "what good looks like" for each metric, and how to rigorously track and monitor these metrics. This team can also identify gray areas where risks are hard to understand or define (e.g. tiers of the supply chain where no visibility exists). This analysis can dimensionalize the scale and scope of unknown risks.

Unknown risks are those that are impossible or very difficult to foresee. Consider the sudden eruption of a long dormant volcano that disrupts a supplier you didn't know was in your supply chain, or the exploitation of cybersecurity vulnerability buried deep the firmware of a critical electronic component. Predicting scenarios like these is likely impossible for even the most risk-conscious managers.

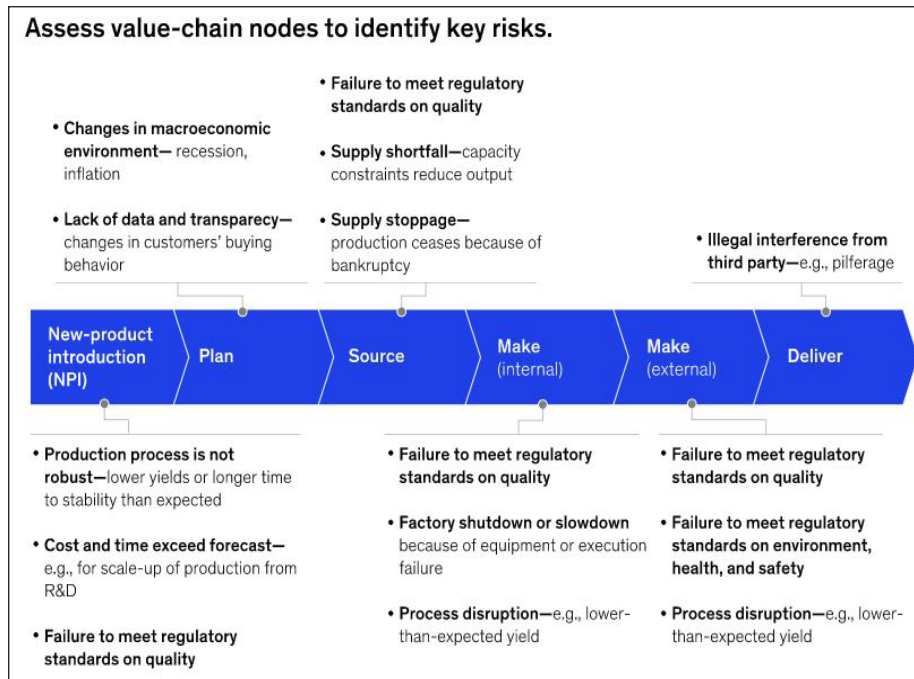
For unknown risks, reducing their probability and increasing the speed of response when they do occur is critical to sustaining competitive advantage. Building strong layers of defense combined with a risk-aware culture can give an organization this advantage.

Managing known Risks

Organizations can use a combination of structured problem solving and digital tools to effectively manage their known-risk portfolio through four steps:

Step 1: Identify and Document Risks

A typical approach for risk identification is to map out and assess the value chains of all major products. Each node of the supply chain—suppliers, plants, warehouses, and transport routes—is then assessed in detail in figure. Risks are entered on a risk register and tracked rigorously on an ongoing basis. In this step, parts of the supply chain where no data exist and further investigation is required should also be recorded.



Step 2: Build a Supply-Chain Risk-Management Framework

Every risk in the register should be scored based on three dimensions to build an integrated risk-management framework: impact on the organization if the risk materializes, the likelihood of the risk materializing, and the organization’s preparedness to deal with that specific risk. Tolerance thresholds are applied on the risk scores reflecting the organization’s risk appetite.

It is critical to design and use a consistent scoring methodology to assess all risks. This allows for prioritizing and aggregating threats to identify the highest-risk products and value-chain nodes with the greatest failure potential.

Step 3: Monitor Risk

Once a risk-management framework is established, persistent monitoring is one of the critical success factors in identifying risks that may damage an organization. The recent emergence of digital tools has made this possible for even the most complex supply chains, by identifying and tracking the leading indicators of risk. For example, a large organization operating in a regulated industry identified 25 leading indicators of quality issues at its plants and contract manufacturers, ranging from structural drivers including geographical location and number of years in operation to operational performance metrics, such as “right first time” and deviation cycle times. These 25 indicators were carefully weighted to develop a quality risk-exposure score, and then tracked on a regular cadence.

Successful monitoring systems are customized to an organization’s needs, incorporating impact, likelihood, and preparedness perspectives. Hence, while one organization may track deviations on manufacturing lines to predict quality issues, another may follow real-time Caribbean weather reports to monitor hurricane risk at its plants in Puerto Rico. Regardless, it is critical to have an early warning system to track top risks to maximize the chances of mitigating, or at the very least limiting, the impact from their occurrence.

Step 4: Institute Governance and Regular Review

The final critical step is to set up a robust governance mechanism to periodically review supply chain risks and define mitigating actions, improving the resilience and agility of the supply chain.

An effective supply-chain risk-management governance mechanism is a cross-functional risk board with participants representing every node of the value chain. It typically includes line managers who double-hat as risk owners for their function, giving them ownership of risk identification and mitigation. In most cases, the risk board receives additional support from a central risk-management function, staffed with experts to provide additional guidance on identifying and mitigating risks.

An effective board will meet periodically to review the top risks in the supply chain and define the mitigation actions. The participants will then own the execution of mitigation actions for their respective functional nodes. For example, if the board decides to qualify and onboard a new supplier for a critical component, the procurement representative on the board will own the action and ensure its execution.

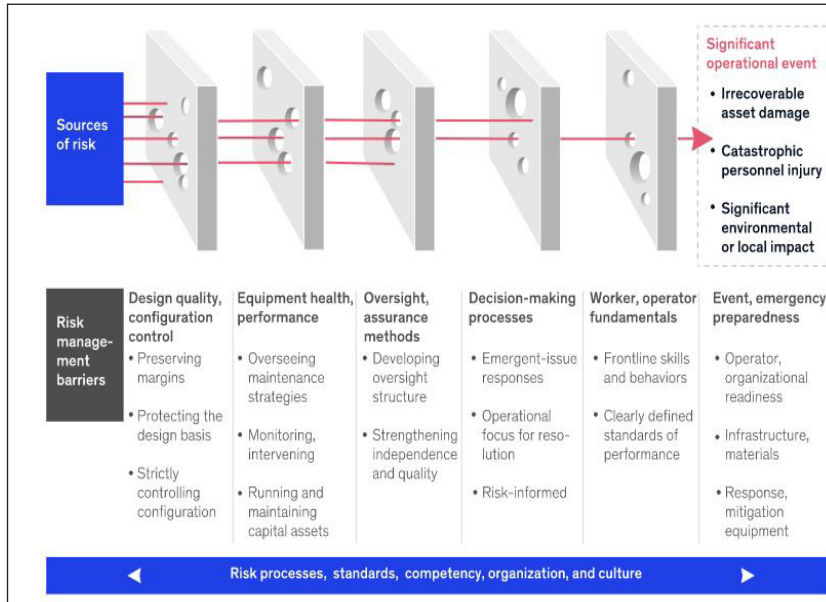
Additionally, in many organizations the risk board will also make recommendations to improve the agility and resilience of the supply chain, ranging from reconfiguring the supply network, finding new ways of reducing lead times, or working with suppliers to help optimize their own operations. Increasing supply-chain agility can be a highly effective mitigation strategy for organizations to improve their preparedness for a wide range of risks.

Managing Unknown Risks

Unknown risks are, by their nature, difficult or impossible to predict, quantify, or incorporate into the risk-management framework discussed above for known risks. In our experience, mitigating unknown risks is best achieved through creating strong defenses combined with building a risk-aware culture.

Building Strong Defenses

Strong defenses, from request-for-proposal (RFP) language to worker training, all contribute to an organization identifying and stopping unknown risks before they affect operations. Exhibit 2 outlines typical layers of defense organizations employ to defend against unknown risks.



Building a Risk-aware Culture

A risk-aware culture helps an organization both establish and maintain strong defensive layers against unknown risks, as well as respond more quickly when an unknown risk surfaces and threatens operations.

- **Acknowledgement:** Management and employees need to feel empowered to pass on bad news and lessons from mistakes. This openness fosters an environment where it is okay to voice and deal with issues. Culturally, it is critical that the organization not get discouraged or point fingers when a risk event occurs, and instead works harmoniously towards a rapid resolution.
- **Transparency:** Leaders must clearly define and communicate an organization's risk tolerance. Risk mitigation often has an associated incremental cost, and so it is important to align on which risks need to be mitigated and which can be borne by the organization. An organization's culture should also allow for warning signs of both internal and external risks to be openly shared.
- **Responsiveness:** Employees need to be empowered to perceive and react rapidly to external change. This can be enabled by creating an ownership environment, where members feel responsible for outcome of actions and decisions.
- **Respect:** Employees' risk appetites should be aligned with an organization, so that individuals or groups do not take risks or actions that benefit themselves but harm the broader organization.

Value Chain

A value chain is a business model that describes the full range of activities needed to create a product or service. For companies that produce goods, a value chain comprises the steps that involve bringing a product from conception to distribution, and everything in between—such as procuring raw materials, manufacturing functions, and marketing activities.

A company conducts a value-chain analysis by evaluating the detailed procedures involved in each step of its business. The purpose of value-chain analyses is to increase production efficiency so that a company may deliver maximum value for the least possible cost.

Because of ever-increasing competition for unbeatable prices, exceptional products, and customer loyalty, companies must continually examine the value they create in order to retain their competitive advantage. A value chain can help a company to discern areas of its business that are inefficient, and then implement strategies that will optimize its procedures for maximum efficiency and profitability.

In addition to ensuring that production mechanics are seamless and efficient, it's critical that a business keep its customers feeling confident and secure enough to remain loyal. Value-chain analyses can help with this, too.

Michael E. Porter, of Harvard Business School, introduced the concept of a value chain in his book, *Competitive Advantage: Creating and Sustaining Superior Performance* (Free Press, 1998). "Competitive advantage cannot be understood by looking at a firm as a whole," Porter wrote. "It stems from the many discrete activities a firm performs in designing, producing, marketing, delivering and supporting its product."

In other words, it's important to maximize value at each specific point in a firm's processes.

Components of a Value Chain

In his concept of a value chain, Porter splits a business's activities into two categories, "primary" and "support," whose sample activities we list below. Specific activities in each category will vary according to the industry.

Primary activities consist of five components, and all are essential for adding value and creating a competitive advantage:

1. **Inbound logistics:** Functions like receiving, warehousing, and managing inventory.
2. **Operations:** Procedures for converting raw materials into finished product.
3. **Outbound logistics:** Activities to distribute a final product to a consumer.
4. **Marketing and sales:** Strategies to enhance visibility and target appropriate customers—such as advertising, promotion, and pricing.
5. **Service:** Programs to maintain products and enhance consumer experience—customer service, maintenance, repair, refund, and exchange.

Support Activities

The role of support activities is to help make the primary activities more efficient. When you increase the efficiency of any of the four support activities, it benefits at least one of the five primary activities. These support activities are generally denoted as overhead costs on a company's income statement:

1. **Procurement:** How a company obtains raw materials.
2. **Technological development:** Used at a firm's research and development (R&D) stage-designing and developing manufacturing techniques; and automating processes.
3. **Human resources (HR) management:** Hiring and retaining employees who will fulfill business strategy; and help design, market, and sell the product.
4. **Infrastructure:** Company systems; and composition of its management team-planning, accounting, finance, and quality control.

Examples of Value Chains

Starbucks Corporation

Starbucks offers one of the most popular examples of a company that understands and successfully implements the value-chain concept. There are numerous articles about how Starbucks incorporates the value chain into its business model.

Trader Joe's

Another example is Trader Joe's grocery store, which also has received much press about its tremendous value and competitive edge. Because the company is privately held, however, there are many aspects of its strategy that we will never know. Below, we cite observable instances of Trader Joe's business that reflect the five primary activities of the value chain.

Inbound Logistics

Unlike traditional supermarkets, Trader Joe's does all of its receiving, shelving, and inventory-taking during regular store hours. Although potentially maddening for shoppers, this system creates a ton of cost savings in terms of employee wages alone. Moreover, the logistics of having this work take place while customers are still shopping sends the strategic message that "we're all in this together."

Operations

Here's an example of how a company could apply the value chain creatively. In primary activity number two above, "converting raw materials into finished product" is cited as an "operations" activity. However, because converting raw materials is not an aspect of the supermarket industry, we can use operations to mean any other regular grocery store function. So, let's substitute "product development," as that operation is critical for Trader Joe's.

The company selects its products carefully, featuring items that you generally can't find elsewhere. Its private-label products account for at least 70 percent of its offerings, which often have the highest profit margins, too, as Trader Joe's can source them efficiently in volume. Another vital piece of product development for Trader Joe's is its taste-testing and chef-partnership programs, which ensure high quality and continuous product refinement.

Outbound Logistics

Many supermarkets offer home delivery, but Trader Joe's does not. Yet here, we can apply the activity of outbound logistics to mean the range of amenities that shoppers encounter once they are inside a Trader Joe's store. The company has thought carefully about the kind of experience it wants us to have when we visit its stores.

Among Trader Joe's' many tactical logistics are its in-store tastings. Usually, there are a few product tastings happening simultaneously, which create a lively atmosphere, and often coincide with the seasons and holidays. The tasting stations feature both new and familiar items that are prepared and served by staff.

Marketing and Sales

Compared to its competitors, Trader Joe's barely does any traditional marketing. However, its entire in-store experience is a form of marketing. The company's copywriters craft product labels to appeal specifically to its customer base. Trader Joe's unique branding and innovative culture indicate that the company knows its customers well—which it should, as the firm has actually chosen the type of customers it prefers and has not deviated from that model.

Via this indirect marketing of style and image, Trader Joe's has succeeded in differentiating itself in the marketplace, thus sharpening its competitive edge.

Service

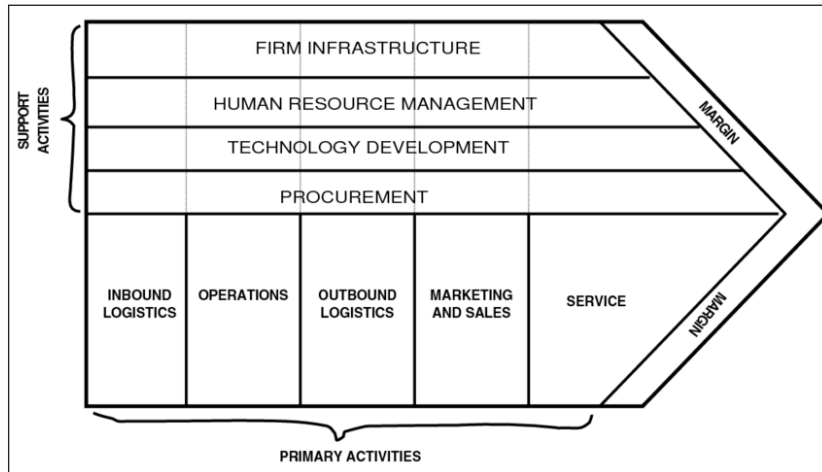
Customer service is paramount for Trader Joe's. Generally, you see twice as many employees as shoppers in its stores. Whatever work they are doing at the moment, the friendly, knowledgeable, and articulate staffs are there primarily for you. Employees welcome shoppers' interruptions and will instantly rush to find your item or answer your question. In addition, the company has always employed a no-questions-asked refund program. You don't like it, you get your money back—period.

This list could go on and on before ever reaching the four support activities, as Trader Joe's is a wildly successful example of applying value-chain theory to its business.

Value Chain Analysis

Value chain analysis is a way to visually analyze a company's business activities to see how the company can create a competitive advantage for itself. Value chain analysis helps a company understand how it adds value to something and subsequently how it can sell its product or service for more than the cost of adding the value, thereby generating a profit margin. In other words, if they are run efficiently the value obtained should exceed the costs of running them i.e. customers should return to the organisation and transact freely and willingly.

Originated in the 1980s by Michael Porter, value chain analysis is the conceptual notion of value-added in the form of a value chain. He suggested that an organisation is split into 'primary activities' and 'support activities'. The figure below divides activities into primary and support activities as suggested by Porter's Value Chain Analysis model:



Competitive Advantage

Value Chain Analysis is mentioned extensively in the first half of the book "Competitive Advantage" in 1985 by Michael Porter. Porter suggested that activities within an organisation add value to the service and products that the organisation produces, and all these activities should be run at optimum level if the organisation is to gain any real competitive advantage. Competitive Advantage is the ability for a firm to put "generic strategy" into practice, generic strategy includes:

1. **Cost Leadership:** offer the lowest price to customers.
2. **Differentiation:** selecting the important attributes that buyers want so the company can get a premium price.
3. **Focus:** doing each strategy according to each market segment.

What activities a business undertake is directly linked to achieving competitive advantage.

For example:

1. A business which wishes to outperform its competitors through differentiating itself through higher quality will have to perform its value chain activities better than the oppositions.
2. By contrast, a strategy based on seeking cost leadership will require a reduction in the costs associated with the value chain activities, or a reduction in the total amount of resources used.

Basic Concepts of Value Chain Analysis

Most organizations engage in hundreds, even thousands, of activities in the process of converting inputs to outputs. These activities can be classified generally as either primary or support activities that all businesses must undertake in some form.

Primary Activities

Primary activities are directly concerned with creating and delivering a product. They can be grouped into five main areas: inbound logistics, operations, outbound logistics, marketing and sales, and service. Each of these primary activities is linked to support activities which help to improve their effectiveness or efficiency; and According to Porter (1985), the primary activities are:

1. **Inbound logistics:** Refers to goods being obtained from the organisation's suppliers and to be used for producing the end product.
2. **Operations:** Raw materials and goods are manufactured into the final product. Value is added to the product at this stage as it moves through the production line.
3. **Outbound logistics:** Once the products have been manufactured they are ready to be distributed to distribution centres, wholesalers, retailers or customers. Distribution of finished goods is known as outbound logistics.
4. **Marketing and Sales:** Marketing must make sure that the product is targeted towards the correct customer group. The marketing mix is used to establish an effective strategy, any competitive advantage is clearly communicated to the target group through the promotional mix.
5. **Services:** After the product/service has been sold what support services does the organisation offer customers? This may come in the form of after sales training, guarantees and warranties.

With the above activities, any or a combination of them are essential if the firm are to develop the "competitive advantage" which Porter talks about in his book.

Support Activities

Support activities assist the primary activities in helping the organisation achieve its competitive advantage. There are four main areas of support activities: procurement, technology development (including R&D), human resource management, and infrastructure (systems for planning, finance, quality, information management etc.). They include:

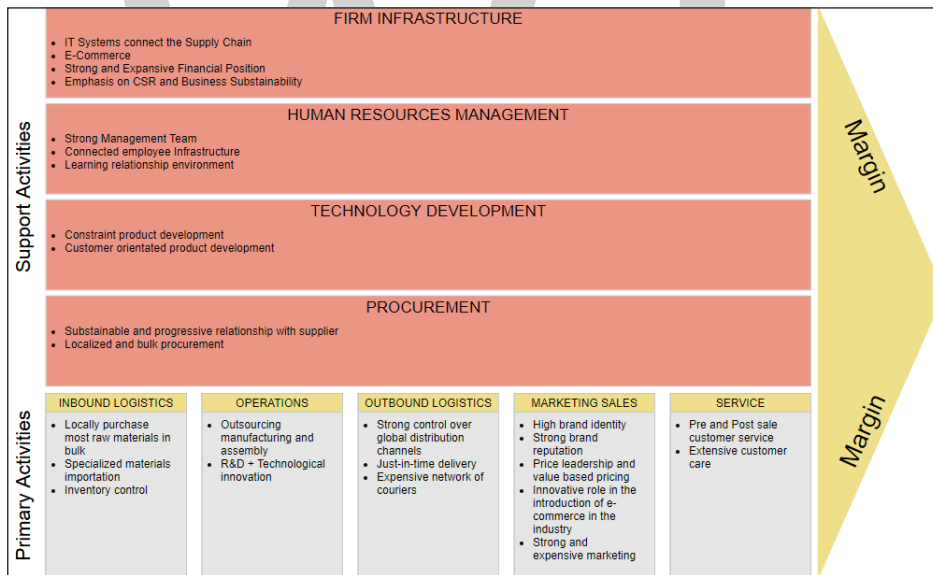
1. **Firm infrastructure:** Every organisations needs to ensure that their finances, legal structure and management structure work efficiently and helps drive the organisation forward. Inefficient infrastructures waste resources, could affect the firm's reputation and even leave it open to fines and sanctions.
2. **Human resource management:** The organisation will have to recruit, train and develop the correct people for the organisation to be successful. Staff will have to be motivated and paid the 'market rate' if they are to stay with the organisation and add value. Within the service sector such as the airline industry, employees are the competitive advantage as customers are purchasing a service, which is provided by employees; there isn't a product for the customer to take away with them.

3. **Technology development:** The use of technology to obtain a competitive advantage is very important in today’s technological driven environment. Technology can be used in many ways including production to reduce cost thus add value, research and development to develop new products and the internet so customers have 24/7 access to the firm.
4. **Procurement:** This department must source raw materials for the business and obtain the best price for doing so. The challenge for procurement is to obtain the best possible quality available (on the market) for their budget.

Link between Primary and Support Activities

As mentioned before, primary activities add value directly to the production process, but they are not necessarily more important than support activities. Nowadays, competitive advantage mainly derives from technological improvements or innovations in business models or processes. Therefore, such support activities as ‘information systems’, ‘R&D’ or ‘general management’ are usually the most important source of differentiation advantage. On the other hand, primary activities are usually the source of cost advantage, where costs can be easily identified for each activity and properly managed.

Value Chain Diagram Example Super Store Super Market



Value chain analysis is based on the principle that organisations exist to create value for their customers. In the analysis, the organisation’s activities are divided into separate sets of activities that add value. The organisation can more effectively evaluate its internal capabilities by identifying and examining each of these activities. Each value adding activity is considered to be a source of competitive advantage.

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The image shows the letters 'WWT' in a large, bold, light gray font. The 'W' is composed of three vertical strokes, and the 'T' is a simple vertical stroke with a horizontal top bar. The letters are centered horizontally on the page.